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FACULTY WORKING PAPER 93-0118

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The Group Performance Illusion

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February 1993

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RUNNING HEAD: GROUP PERFORMANCE ILLUSION

Abstract

The enthusiasm for groups found in popular writing on organizations contrasts dramatically with the negative reviews of group performance in the academic literature. Although the academic literature typically reports group products that are inferior to the products of aggregated individuals, people generally prefer working in groups and believe that groups produce better results. This research examines the causes for this phenomenon and demonstrates a systematic group performance illusion in which groups consistently rate the quality of their group's performance significantly better than other same-sized groups. Unless the task is quite difficult, groups commit a logical error: on average, they rate themselves above average. The larger the group, the greater this illusion. The group performance illusion persists over time. In contrast, on the tasks used in these studies individuals consistently rate themselves substantially below average. Group members also experience more enjoyment and less stress than individuals; and report greater satisfaction and more confidence in their solutions than do individuals.

The popular business literature loudly promotes the use of groups for the management of corporate activity. As Deal and Kennedy (1982, p. 177) put it, "A combination of forces - from the rapidly changing business environment to the new work force to the astonishing advances of technology-is forging a breakdown of the large traditional, hierarchical organizations that have dominated in the past. We think that this dismantling will result in highly decentralized organizations in which the work of the corporation will be done in small, autonomous units linked to the megacorporation..." In the popular press, we see groups lauded as solutions for problems in all levels of organizations: quality circles, worker teams, executive committees and offices of the president. Among organizational gurus, there is a fundamental belief that small groups are the solution to allowing the organization of the future to react nimbly to segmented global markets. The new "virtual" corporation will rely on small groups reacting to individual markets by coordinating the efforts of separate, specialist organizations (Byrne, Brandt & Port, 1993). All of these things, according to the media, mean that working in groups will become increasingly important.

Working in groups provides many apparent benefits. It seems inherently logical that when designing an auto or planning a new building that bringing together those who have special expertise allows for a more informed decision. Indeed, some researchers have found that groups can work well together, especially if those tasks are carefully structured and require specific skills, knowledge, and capabilities (Hackman, 1989; Kelley & Thibaut, 1969; McGrath, 1984).

On the whole, however, academic research tends to be quite cynical about the benefits of groupwork. This provides a striking contrast to the positive reviews given to

groups in popular views of organizations. For example, Stroebe, Diehl, and Abakoumkin (1992) comment on the "striking discrepancy between everyday beliefs and scientific evidence" about the usefulness of group brainstorming as an idea-generating mechanism (see also Paulus, Dzindolet, Poletes, & Camacho, 1993). After conducting a detailed review of the research comparing groups to individuals, a panel convened by the National Research Council commented that "team performance decrements have been observed in such a wide variety of task domains and performance environments that it seems prudent to regard suboptimal team performance as the norm" (Druckman, & Bjork, 1991, p. 251). Instead of finding the supposed "synergy" of group efforts--that groups are more than the sum of their parts--academic researchers typically find that groups are de-synergistic (see Hill, 1982; Hastie, 1986, for reviews). In brainstorming tasks, for example, one person's *Eureka!* may distract other members of the group from their own individual thoughts. While providing a feeling that something unique had been gained, little thought is given to the distracting nature of this discovery. Academic research has taken pride in pointing out the "flaws" associated with group processes: from Whyte's (1956) comments about conformity and "belonging" through the risky shift and group polarization research of the 60's and 70's (Brown, 1965) to the group performance research of the 70's and 80's (Hill, 1982; Hastie, 1986).

Given that there is little evidence that groups are more effective than individuals in problem solving, why do organizations of all stripes retain such enthusiasm for group activities as "solutions" to organizational problems? Why are group problem-solving techniques such as brainstorming so popular? The following set of experiments was designed to determine what emergent factors of groupwork lead to its popularity. We define groupwork as the experience of working with other people in making a common

decision or producing a joint product. Our emphasis on groupwork is important. Some "groups" require us to work with others who do not share common goals. Such situations can give rise to conflict. It is the different incentives, viewpoints and so on that often make committee meetings contentious. Our experiments are designed to model groups that have common goals and share a common fate. We set out to examine the ways that individuals and groups viewed both their objective performance and their subjective experience in completing a wide variety of tasks. Our expectation was that we would find strong evidence of perceptual and emotional advantages of participating in groupwork. Based on our research, we suggest two reasons for the discrepancy between popular attitudes towards groups and academic writing on groups.

First, based on the experiments below, we suggest that experience is likely to teach us that our group products are of exceptionally high quality. Our experiments demonstrate that those who work in groups hold a systematic illusion about the quality of their group's performance. Members of groups often rank their group's performance so high compared to other groups that the rankings constitute a logical error: the average group frequently ranks itself above average in performance. We further demonstrate that this group performance illusion is consistent over several domains and is monotonically related to group size (up to 4 members in a group).

Second, we point out that performance may not be the main dimension on which people encode their group experiences. Academic research on groups often omits attention to the social and motivational aspects of groups. Given the social nature of groups, it is not surprising that group performance is often suboptimal. In group problem solving we may be forced to compromise our arguments for a perceived short-term truth in order to preserve a long-term relationship. We may be distracted from the task by the

enjoyment of the process. While the social aspects of groups may produce some "process losses," they may have their own advantages in terms of motivation. Groups are a source of motivation, commitment, and identity. They raise our enthusiasm for a task and hedge the disappointment of failure. Below, we also document the effects of groupwork on positive affect.

In labeling our major finding as a performance illusion, we make reference to an important literature in social psychology. In a widely cited article, Taylor and Brown (1988) argued against the traditional view that seeing the world incorrectly is a sign of mental illness. In fact, they argue, normal, well-adjusted people maintain pervasive and systematic positive illusions about themselves, the quality of their future outcomes, and their ability to control their environment. Taylor and Brown argue that positive illusions may be emotionally and socially adaptive.

Consistent with Taylor and Brown, we believe that the group performance illusion is emotionally adaptive. However, in our work we find no performance illusions for individuals--the illusion we document below is uniquely a group effect. In documenting this illusion we hope to both shed light on why groups persist as solutions to organizational problems, and to suggest a reason why groups should persist.

Experiment 1

The first experiment was designed to see if groupwork would produce a distortion in the accuracy of performance judgments.

Method

107 advanced undergraduate business students, who participated in the experiment for course credit, were randomly assigned, blocked for gender, to either the *3-person group* or *individual* conditions. Subjects were then given 1 inch of standard-sized newspaper (all magazine-type inserts were removed) and 1 roll of 3/4 inch masking tape. They were then instructed to build the tallest tower that they were able. They were told that it must be free-standing, not attached to a wall or similar support, nor affixed to the floor. They were given 30 minutes to complete this task. After completion of the task, they were asked to rank their performance relative to other individuals or groups (in this and all subsequent experiments, groups compare themselves only to same-sized groups and individuals compare themselves only to other individuals). Subjects in this study were highly motivated to perform well as the higher their score, the greater their number of bonus grade points. After completion of the task, they were asked to assign a percentile rank to their performance.

A general note about our dependent measure: In the experiments in this paper, our key dependent measure will ask people to assign a percentile rank to their performance relative to other groups of the same size. For example, a ranking of 60% will mean that they believe that their performance exceeds 60% of comparison, same-sized groups. Individuals will always be asked to rank their performance relative to other individuals, dyads relative to dyads, etc. The percentile measure is borrowed from the literature on positive illusions and provides a quick logical check to guide our interpretation of subject's reports: if people are accurate, on average we would expect people to rank their performances as average.

Results

As can be seen in Figure 1, groups significantly overrated their performances, reported here as the percentage of groups which they felt that they had performed better than, when compared with individuals' ratings versus other individuals $t(55) = -2.51, p < .02$. When controlling for actual performance by using actual height as a covariate, the result was still significant, $F(1,106) = 4.17, p < .02$.

Insert Figure 1 about here

Discussion

This experiment demonstrates a performance illusion on the part of group participants. Those who participated in groups rated their group product on average better than 59% of other groups. In contrast, those in the individual condition rated themselves as better than only 42% of other individuals. It should be noted that subjects constructed their towers in full view of other builders. Therefore, they had ample opportunity to compare their performances against the actual results of other groups.

Experiment 2

Experiment 2 was designed to systematically explore the influence of group size on the group performance illusion which was identified in Experiment 1. In addition to this, we were interested in determining if affective reactions, such as personal satisfaction, confidence and enjoyment, were also influenced by groupwork.

Method

68 advanced undergraduate business students were randomly assigned, blocked for gender, to the experimental conditions; *individuals*, *dyads* or *quadruples*. Subjects worked on three very difficult logic puzzles which required them to weight evidence and draw inferences and to decode complex symbolic substitutions. There was a 17-minute time limit to complete each of the puzzles. After completion, subjects were asked to rank the productivity of their performance against their perceptions of other groups' performances by indicating what percent (to a maximum of 100%) they felt that they had performed better than. They then rated, on a 10-point scale with 10 indicating a very great deal, 5 a moderate amount and 0 indicating none, the amount of stress they experienced, their excitement about the experiment, the difficulty of the task, their performance satisfaction, their confidence with the quality and accuracy of their work, and the amount of enjoyment which they had experienced in the experiment.

Results

As can be seen in Figure 2, groups again ranked themselves as better than their comparative groups significantly more than individuals, $F(2,67) = 11.81, p < .0001$. Differences between conditions were tested using the Newman-Keuls technique. The results of this analysis showed that the group performance illusion increased for quadruples so that quadruples significantly rated their performances better than individuals and doubles, $ps < .01$.

Across conditions, groups also reported greater satisfaction with their performance, $F(2,67) = 10.14, p < .0001$, more enjoyment of the task, $F(2,67) = 6.29, p < .002$, and more confidence in the accuracy of their effort, $F(2,67) = 7.79, p < .001$.

Insert Figure 2 about here

Discussion

This experiment demonstrated that as size increases, the group performance illusion becomes stronger, $r = .52$, $p < .0001$ and that groupwork also stimulates positive affective reactions: group members enjoyed the task more and were more satisfied with their performance.

Experiment 3

Experiment 3 was designed to replicate the effect of group size on performance ratings and on affective reactions using analytical and brainstorming tasks. We were interested in determining if the group performance illusion was persistent over time and if any attitude change concerning the productivity of groups occurs based upon subjects' participation in the study.

Method

101 advanced undergraduate business students, who participated for course credit, were randomly assigned, blocked for gender, to the three experimental conditions; *individuals*, *dyads*, and *quadruples*. Subjects first filled out a brief questionnaire which asked all subjects for their initial beliefs about the performance of groups and nominal groups on brainstorming tasks. The questionnaire asked subjects to imagine creating a "nominal" group of five people by aggregating the responses of five individuals on a

brainstorming task. They were asked to compare how this nominal group would perform on quality and quantity of ideas relative to a real group of five people.

The experiment involved two separate tasks: a creative brainstorming task, and a logical / analytical task. Subjects who participated in groups assigned a percentile ranking to their group at two different times: once as an individual and once as a consensual group. In order to eliminate social pressure as an explanation for the higher rankings by group members, in this experiment we took special care to physically separate group members during the time when they assigned their individual rankings, and we stressed that other group members would never see their individual responses.

Part (a): Brainstorming task: Subjects worked to create a list of new products for the 3M Company. The products were to be practical for the collegiate market and fit with existing product lines. The subjects had 20 minutes to complete the task. After the task, subjects were separated and were asked to individually assign a percentile rank to their group performance (as in previous experiments, this involved indicating how well their group performed relative to other same-sized groups). They then rated, on a 10-point scale, the amount of stress they experienced, their excitement about the experiment, the difficulty of the task, their performance satisfaction, their confidence with the quality and accuracy of their work, and the amount of fun which they had in the experiment.

The groups were then re-formed and gave, as a group, a percentile ranking to their group performance.

Part (b): Analytical task: In the second part of the experiment, subjects followed an identical procedure but were required to solve 8 GRE-styled analytical problems within a time limit of 17 minutes. Following completion of the analytical problems, subjects were again separated and asked to complete the same questions they answered about the

brainstorming task. (Subjects gave a percentile rank to their group’s performance, and rated their stress, excitement, satisfaction, etc.) Then subjects again formed their groups and, as a group, assigned a percentile rank to their group’s performance on the analytical task.

At the end of the experiment all subjects again filled out the brief questionnaire which asked all subjects to indicate their beliefs about whether real groups would outperform nominal groups (aggregates of individuals) on the brainstorming task. One week later, subjects were asked to (individually) rate their performance on the brainstorming and analytical tasks versus other individuals or groups. This measured the persistence of the group performance illusion.

Insert Figure 3 about here

Results

As can be seen in Figure 3, the results of the brainstorming task replicated previous findings in that subjects working in groups rated their performances significantly higher against same-sized groups than individuals against other individuals both when rating as pooled (by experimental groups) individuals, $F(2,49) = 14.27, p < .0001$ and when rating as groups, $F(2,49) = 15.91, p < .0001$. This result was replicated by the analytical task as well as is indicated by Figure 3, with pooled individual ratings, $F(2,49) = 12.72, p < .0001$, and with group ratings, $F(2,49) = 14.03, p < .0001$. Group ratings were highly correlated with individual ratings, $r(105) = 0.72, p < .0001$ for the brainstorming task and $r(105) = 0.80, p < .0001$ for the analytical task.

Only in the individual condition of the brainstorming task did performance actually relate somewhat to ranking, $r(21) = 0.39, p < .04$. In the analytical task, only the quadruple condition had a significant but negative relationship between performance and rating, $r(21) = -0.40, p < .001$.

On the brainstorming task, significant differences favoring groups were also found in reported stress level, $F(92,100) = 3.92, p < .02$; perceived task difficulty, $F(2,100) = 6.91, p < .001$; in performance satisfaction, $F(2,100) = 11.26, p < .0001$; in confidence concerning accuracy of performance, $F(2,100) = 2.57, p < .05$; and in having more fun completing the task, $F(92,100) = 3.43, p < .02$.

On the analytical task, significant differences were found favoring groups for satisfaction, $F(2,100) = 11.221, p < .0001$, and in performance accuracy confidence, $F(2,100) = 3.33, p < .02$.

At the beginning of the experiment, the majority of subjects thought that groups were better than aggregated individuals for quality of performance (54%) and for quantity (65%). After the experiment, an increased number of subjects favored groups for quality (66%) and quantity (78%). This result is displayed in Figure 4.

Insert Figure 4 about here

As illustrated by Figure 5, the group performance illusion proved to be persistent over the following week as initial brainstorming and analytical group performance ratings were significantly correlated with ratings taken a week later, $r(97) = 0.71, p < .0001$ and $r(97) = 0.60, p < .0001$, respectively with little change for group members.

Insert Figure 5 about here

Discussion

This experiment replicated previous findings using quite different tasks and identified an attitude shift toward group activity as more productive which was unjustified based upon actual performance results. That the group performance illusion proved to be persistent, at least over a one week time period, suggests that the popular preference for brainstorming techniques is related to the group performance illusion.

General Discussion

We began this paper by asking why popular writing on organizations expressed such enthusiasm for groupwork while the academic literature demonstrates such a lack of enthusiasm. In drawing conclusions about life, academic researchers have the luxury of control groups. The current results suggest that in the absence of the right experimental controls, our groups are likely to leave us with the unrealistically positive notions about group performance. When we are in a group and others come up with a clever solution we ourselves would not have considered, we are likely to attribute our reaction to this *Eureka!* event to *this* uniquely savvy group of people. We don't often take the time to mentally estimate whether other groups might have produced the same positive surprises.

In their work on brainstorming, Diehl and Stroebe (1991; see also Paulus, et al, 1993) suggested this kind of "baseline fallacy" as a reason why people believe that groups

are superior to individuals on brainstorming tasks: since we don't participate in nominal groups as a part of our everyday life, we don't have the experimental controls for our group brainstorming experiences. The current results indicate that such baseline fallacies are even more pervasive than these researchers suggest--people not only believe that their real group is better than a nominal group, but that their real groups are better than other real groups. Although the baseline fallacy is probably part of the effect, it is possible that similar effects could be documented even if people were apprised of the relevant baseline. Blake and Mouton (1961, 1962) found that groups who are given the actual solution of a competing group tended to rate their own solution as better.

The group performance illusion documented in these three experiments is large and robust. The size of the performance illusion increases monotonically with group size. It occurs in creative tasks (Experiment 3a), logical/analytical tasks (Experiments 2 and 3b), and in engineering productivity tasks (Experiment 1). The performance illusion occurs even when other's performance can be easily assessed--in the tower building task of Experiment 1, subjects could look around them and see the performance of other groups.

That the performance illusion occurs on both creative and analytical tasks suggests that the effect is not dependent upon the group's task. Initially we had anticipated that the effect would be reversed for analytical tasks since any GRE-styled logic problem is difficult to divide in a way so that it can be distributed across people. Therefore, it requires the type of intense coordination which we had believed would lead to conflict and leave the group participants dissatisfied with their efforts. Although the task was fractious for the groups (subjects working in groups reported higher stress levels in the analytical task, $\bar{M} = 6.62$ when compared with the brainstorming task, $\bar{M} = 3.5$, greater difficulty, $\bar{M} = 8.0$ versus $\bar{M} = 5.9$, less satisfaction, $\bar{M} = 5.8$ versus $\bar{M} = 7.1$, and less

enjoyment, $\underline{M} = 5.0$ versus $\underline{M} = 6.4$), the group performance illusion was still apparent. The difficult nature of the task did lower the average group's ranking of its performance, but individuals lowered their rankings as well.

The performance illusion is not a result of social pressure. In Experiment 3, groups members were separated for their individual rankings and were given assurances that other group members would not see their rankings. Yet, there was no significant discrepancy between individual ratings and when the groups re-formed and rated their effort as a group. The illusion occurs in and is shared by individuals who have been involved in groupwork.

An open question is the relationship between the group performance illusion and the positive affective reactions of group members (e.g. lowered stress, greater enjoyment, etc.). Perhaps performance perceptions come first: we may enjoy ourselves in groups because we feel that we are performing well. This allows us to relax and enjoy the process. The other possibility is that the causality runs the opposite way: being in a group causes us to feel better and our good feelings cause us to rate our performances higher. Research has shown that people often use current mood to infer answers to other questions. When we are in a good mood, we rate the quality of our housing and career choices more highly (cf. Schwartz, Strack, Kommer, & Wagner, 1987). Finding that ratings tend to persist for at least one week increases the plausibility that performance perceptions come first, since mood states don't persist that long (however, someone might still explain the phenomenon in terms of mood at the time performance judgements were encoded).

Positive group and negative individual illusions

Although the label we have chosen for this phenomenon alludes to literature on positive illusions in individuals, we highlight that there are no positive illusions for individuals on these tasks. Quite the contrary, individuals consistently rated their performances below average. Therefore these experiments identify two factors which may encourage lay observers to feel enthusiastic about groups: people not only feel good about their group performances, they also feel bad about their individual performances.

In explaining why we find negative illusions, we consider one trivial and two substantive differences between our results and previous results on individual positive illusions. A trivial difference in reporting procedures does not explain the results--we report average ranks while the positive illusions literature typically reports the percentage of people who report themselves above average. However, medians and averages in our data tend to be similar, and the pattern of results remains unchanged if we consider the median rank rather than average rank.

A more important difference relates to the kind of tasks we examine. Many of the results reported in the positive illusions literature on individuals concern tasks which allow people to subjectively redefine the criteria for successful performance. For example, we can each define good driving so that we are all better drivers than others, or define leadership so that we are all better leaders than others. The performance measures on most of the tasks used in these experiments are clearer: the height of a tower or the number of correctly solved logic problems.

Secondly, the positive illusions literature typically asks people to predict some aspect of their future performance or to predict some future outcome. Our measures asked people to assess their relative performance after participating in a specific task. The negative illusions we document could be driven by a contrast between the positive

expectations described in the positive illusion literature and the actual difficulty of these tasks. It may be that our results are rooted in performance, while the positive illusion is based on expectations.

Thus the current performance illusion is uniquely a group effect--it does not occur for individuals. In addition, it is powerful enough to occur even in situations where actual performance is easy to access.

Is the performance illusion adaptive?

There is a downside to the performance illusion. Aside from the logical error of average ranks being above average, a performance illusion may lead to more practical errors. If groups are overconfident in their performance and outputs, they may pursue the wrong strategies and commit resources to the wrong projects. The performance illusion may contribute to the "not invented here" syndrome seen in many corporate and institutional settings. People often refuse to take advantage of ideas which arise outside their group because of the strong belief that their group does things better. Indeed, this kind of performance illusion may be one mechanism that underlies Janis' (1972) concept of groupthink: groups think that they are performing correctly--even when they have access to veridical evidence that they are not (Experiment 1).

While there are dangers inherent in this illusion, there are also some reasons to believe that the illusion may be adaptive. Taylor and Brown (1988) argue that individual positive illusions have important benefits. Believing that we are in control and that good things are likely to happen to us makes us more content and happy. In return this may foster pro-social behavior--happy people are more likely to help others. They also suggest that people will be more willing to undertake difficult tasks when they are optimistic about

the possibilities for success, and they will maintain task motivation much longer on tasks when they encounter difficulty. If the world more often rewards action than inaction, positive illusions will lead to better long-run performance.

The power of groups to affect confidence may be especially important when the probability of success may be very low (in creativity or innovation contexts) or in situations where high costs must be endured in order to attain a goal (athletic contests). Some researchers have argued that competitive or highly evaluative environments may be harmful to creativity (Amabile, 1983). Most creative work in industry is done in teams. Group membership may lessen the impacts of competition and evaluation that are supposedly detrimental to creativity (Diehl & Stroebe, 1987).

Motivational effects of groupwork

As compared with individuals, groups in the current studies report less stress, more confidence in the quality of their solutions, and more satisfaction with their results. This pattern of results has been found by other researchers studying the performance of real and nominal groups on brainstorming tasks (Diehl & Stroebe, 1991; Gallupe, Bastianutti, & Cooper, 1991; Stroebe, Diehl, & Abakoumkin, 1992). The academic literature on problem-solving in groups has largely ignored the motivational aspects of groups--and it may be the motivational capabilities of groups and not their performance capabilities that may be most important to organizations. In organizations, finding the optimal answer may not be as important as implementing an answer that is reasonably satisfactory. Although the process of group interaction may produce some "process losses," retaining enthusiasm for a task and satisfaction with a group product may be adaptive when people must do the hard work of following through on their solutions.

Before we use academic research on group problem solving to discourage group efforts in organizations, we should think more broadly about the entire process of problem solving in organizations--especially the motivational aspects of the process. In addition to the dry, cognitive aspects of the process which are considered by most of the group performance literature, there are many other features of group experience. We suggest that the benefits of groupwork might include things such as the following.

a) Groups reduce anxiety. Being with others helps to reduce anxiety and situational ambiguity (Schachter, 1959). When we are in a highly stressful environment, this reduction in anxiety and situational ambiguity may make a difficult task more bearable. Research has shown that evaluation apprehension lowers productivity among individuals but does not negatively impact groups (Diehl & Stroebe, 1987).

b) Groups increase altruistic behavior. We are more likely to witness altruistic behavior among people who have been given an opportunity to establish an identity as a group, even when that opportunity is minimal, even when the payoffs to selfish behavior are very high, and even when there is no tendency to be altruistic toward others who are not a part of our group (Dawes & Thaler, 1988; Kramer, 1992).

c) Groups may increase commitment. Conformity pressures may induce us to make a commitment to group effort and once we have made that commitment, need for consistency will lead us to follow through on this commitment (e.g. Cialdini, 1984; Greenberg & Folger, 1983). This may have positive benefits in implementing decisions.

Conclusion

We have documented a robust positive performance illusion on the part of people involved in groupwork. The "illusion" that we document is often obviously wrong at the

level of logic: it is impossible for the average group to be above the average in their performances. However, the world often runs not on logic but on enthusiasm and emotion. Some have argued that while overconfidence is a drawback in making decisions, it may be valuable in implementing them (Russo & Schoemaker, 1990). If there is some tradeoff between having a perfectly accurate picture of the world and having the enthusiasm to get things done, it seems better to get things done.

Given the evidence on the superiority of individual over group efforts, our colleagues are wont to ask us why we continue to conduct research as a team rather than as individuals. After performing this research, our answer comes easily: It makes us feel better.

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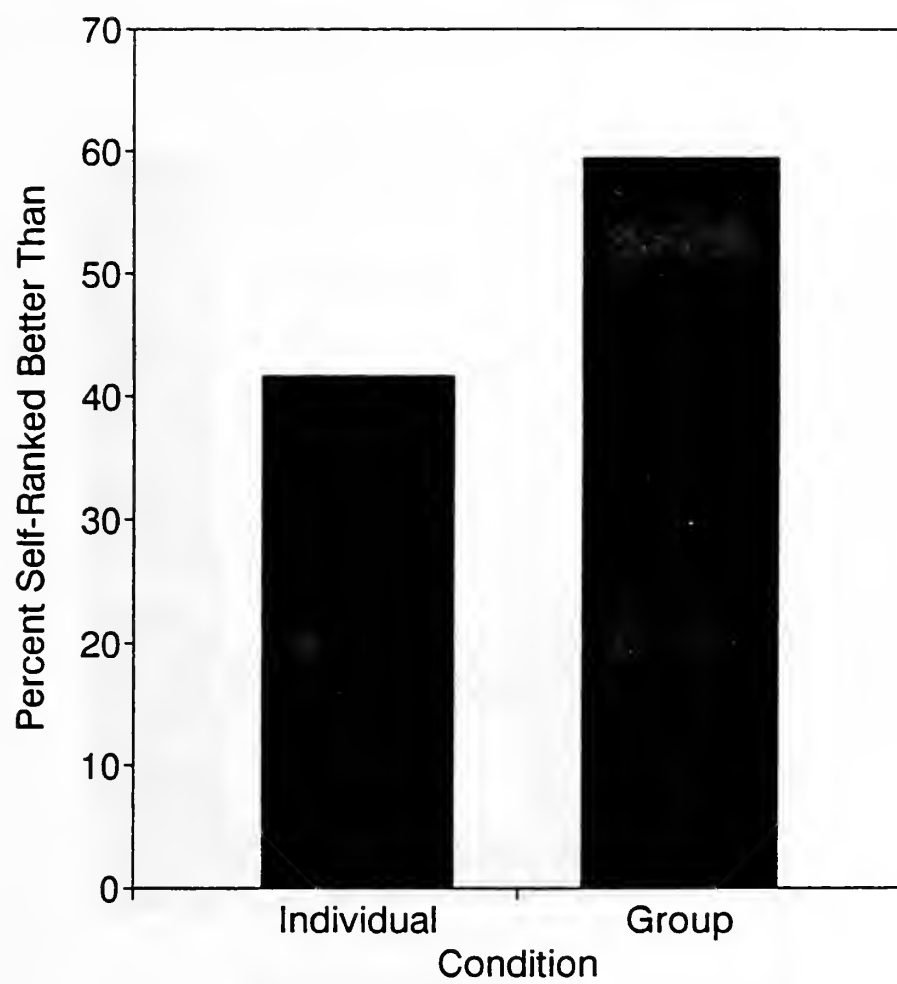
Footnote

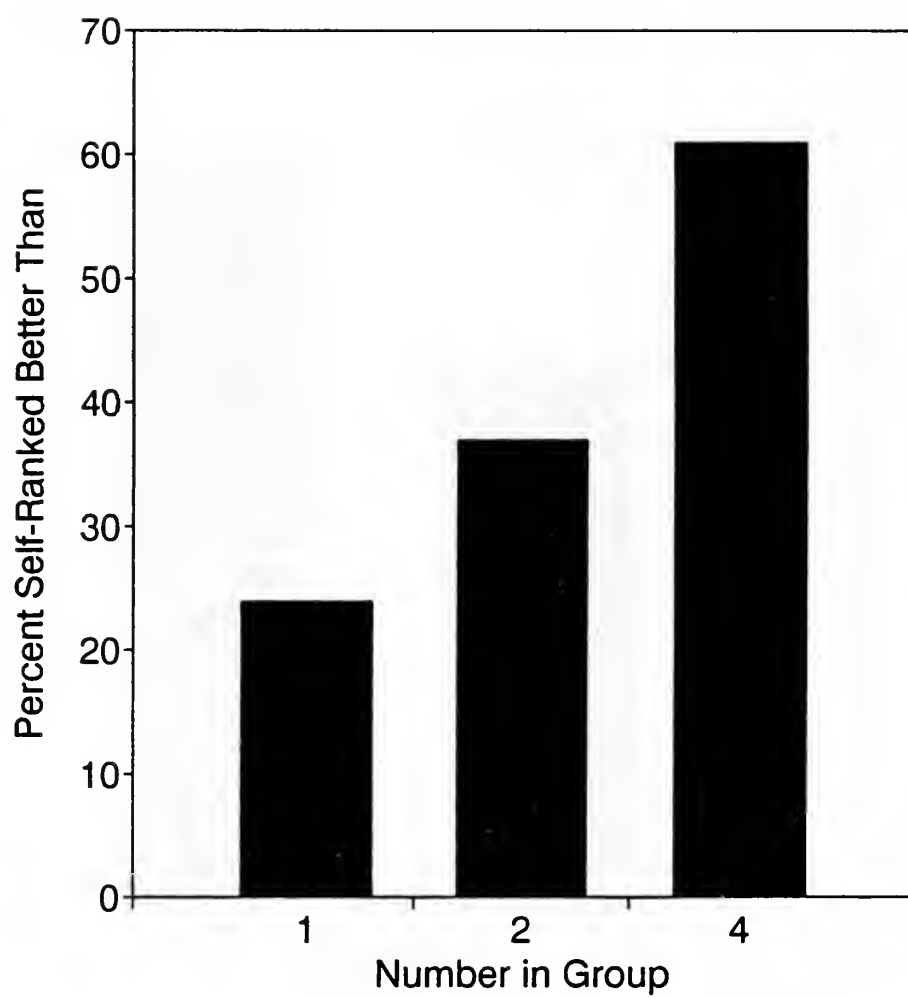
The authors would like to thank Rob Conner, Curt Patten, John Rusk and Scott Motola who acted as experimenters and Carol Kulik, Greg Oldham, and Keith Murnighan who commented on this work.

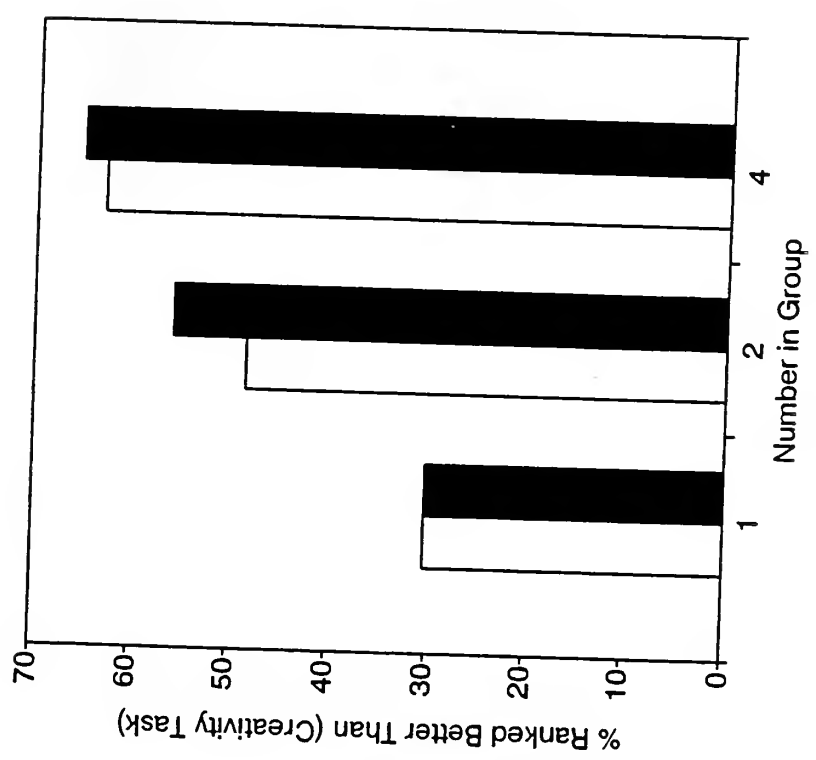
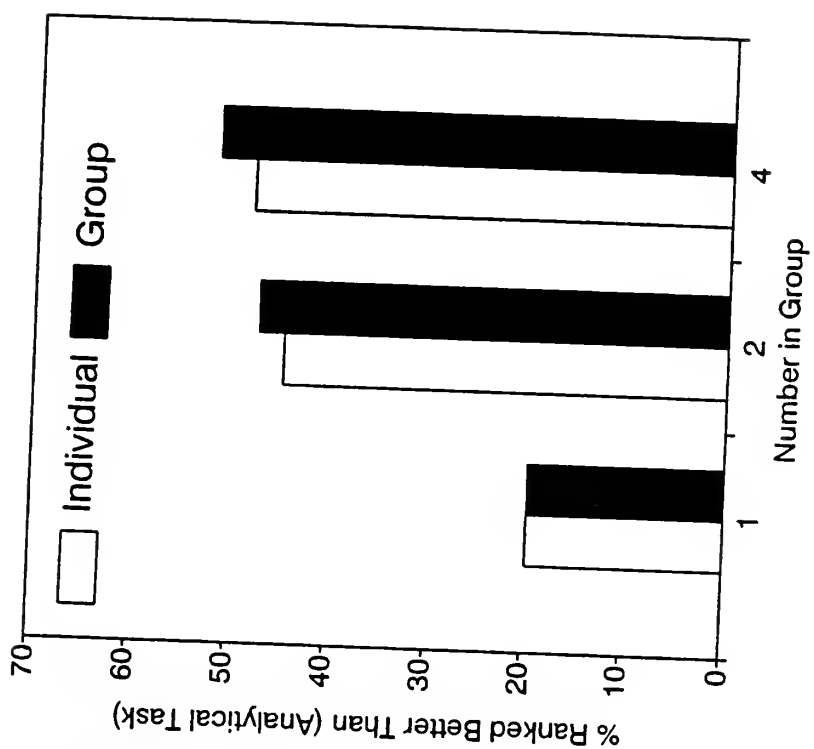
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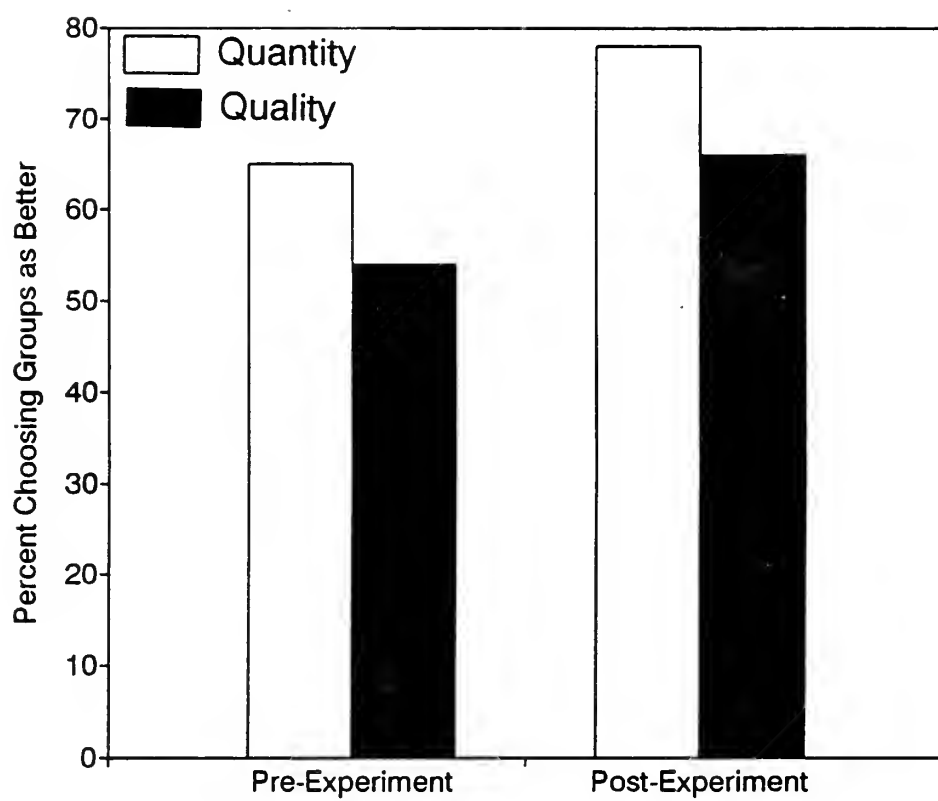
Figure Captions

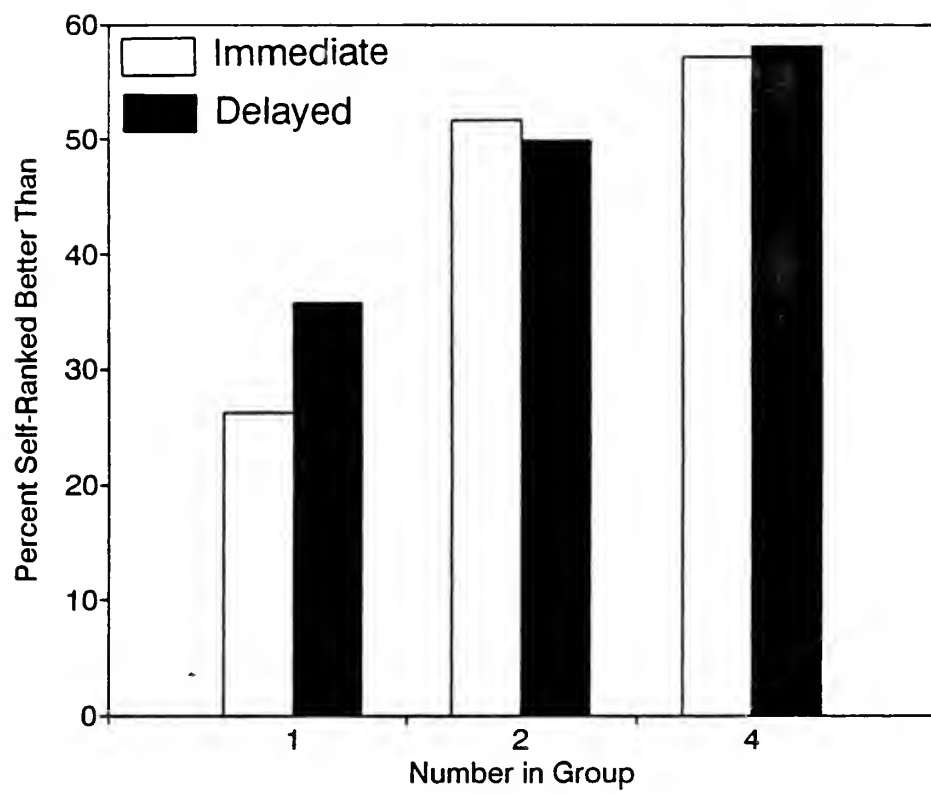
- Figure 1. Performance ratings of individuals and 3-person groups against other individuals and other 3-person groups respectively ($p < .02$.)
- Figure 2. Performance self-ratings of groups against other groups of the same size ($p < .0001$.)
- Figure 3. Performance ratings for brainstorming task (left panel) of groups against other same-sized groups as isolated individuals (white bars) and then as re-formed groups ($p < .0001$) and performance ratings for analytical task (right panel) of groups against other same-sized groups as individuals (white bars) and then as re-formed groups ($p < .0001$).
- Figure 4. Percentage of subjects who believe that groups are better for product quantity (white bars) and for product quality (black bars) before and after completing the experimental task.
- Figure 5. Performance self-rankings of groups against other groups of the same size immediately after experiment completion (white bars) and after a one-week delay (black bars).











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